

REMARKS

This is in response to the Office Action mailed September 19, 2006, in which the Examiner maintained the rejections of claims 1, 7, 8, 19, 24 and 31-36. Reconsideration of the application is respectfully requested.

Claim Rejections – 35 U.S.C. §103

In the Office Action, the Examiner rejected claims 1-7, 8, 19, 24, 31-34 and 36 under 35 U.S.C. §103(a) as being unpatentable over the combination of Knapp et al. (U.S. Patent No. 6,417,999), Tao et al. (U.S. Patent No. 6,737,286), and Segar et al. (U.S. Patent No. 6,368,425). Applicant respectfully believes that the Examiner has failed to establish a *prima facie* case of obviousness against the claims because the references fail to disclose all of the claimed features and there is no suggestion or motivation to combine the cited references.

Knapp et al.

In rejecting independent claims 1, 19 and 31, the Examiner found Knapp et al. to disclose a method of forming a magnetoresistive sensor that includes forming first and second magnetic leads (230) and a junction (253) between the leads. However, the Examiner found that Knapp et al. did not disclose “reducing the magnetic and electrical conductivity of an outer shell portion of the junction, thereby forming a constricted junction comprising a magnetic and electrically conductive junction core that is at least partially surrounded by the outer shell portion” as provided in claim 1 (hereinafter “reducing step of claim 1”), “reducing the magnetic and electrical conductivity of an outer shell portion of the junction by implanting ions of a non-ferromagnetic element into the outer shell portion of the junction” as provided in claim 19 (hereinafter reducing step of claim 19), or “implanting ions of a non-ferromagnetic element into an outer shell portion of the junction” as described in claim 31 (hereinafter “implanting step of claim 31”). However, the Examiner found the combination of Tao et al. and Segar et al. to disclose the claimed reducing steps of claims 1 and 19 and the implanting step of claim 31.

Tao et al.

The Examiner found Tao et al. to disclose “that a constricted junction can be formed by implanting ions onto an outer shell portion of the core (region between leads 70 in Fig. 9) for the purpose of substantially bridging the first and second magnetic leads (col. 10, lines 1-3).” This finding is erroneous.

The junction cited by the Examiner (i.e., region between leads 70 in FIG. 9) is a Pd nanojunction 74 made of Pd atoms formed through an electroplating process. Col. 7, lines 4-7. This junction 74 is not formed of a magnetic material and there is no disclosure in Tao et al. of reducing its magnetic conductivity, which would be impossible. More particularly, following the formation of the cited junction, Tao et al. fail to disclose “reducing the magnetic and electrical conductivity of an outer shell portion of the junction”, as provided in claims 1 and 19, or “implanting ions . . . into an outer shell portion of the junction”, as provided in claim 31.

The Examiner’s finding that Tao et al. “suggests that these leads (e.g., 70 can be formed alternatively of a magnetic and electrically conductive material (e.g., an alloy that includes Fe, col. 9, lines 56-64) when specifically making magnetoresistive sensors” is immaterial, because the cited junction 74 that is formed between the leads 70 is only disclosed as being formed of Pd.

Applicant believes that the Examiner may have intended to suggest that the etching process disclosed by Tao et al., in which metal ions from a first electrode are etched and deposited on a second electrode until the deposited ions reach the first electrode, could be used to form a magnetic junction where the first and second electrodes are formed of a magnetic material. However, Tao et al. fail to disclose or suggest any process that would further reduce the electrical and magnetic conductivity of an outer shell portion of such a junction. Additionally, Tao et al. fail to disclose or suggest implanting ions of any material into such a magnetic junction. Thus, Tao et al. fail to disclose the reducing steps of claims 1 and 19 and the implanting step of claim 31.

Applicant believes that there may some confusion with the disclosure that relates to FIG. 9 of Tao et al., which describes the operation of a “hydrogen nanosensor”, not the formation of a constricted junction of a magnetoresistive sensor. See col. 6, line 66 – col. 7, line

16. Tao et al. do not disclose the implantation of any ions into the Pd nanojunction 74 either during the formation of the junction or during operation of the sensor. Furthermore, even if one construed the exposure of the nanojunction 74 to hydrogen atoms as “ion implantation” there is no disclosure or suggestion of exposing the cited junction formed of magnetic material to hydrogen atoms or any disclosure or suggestion that such an exposure would result in the performance of the reducing steps of claims 1 and 19 or the implanting step of claim 31.

Should the Examiner maintain the finding that Tao et al. describe the reducing steps of claims 1 and 19 and the implanting step of claim 31, Applicant requests that the Examiner direct Applicant to the particular section or sections of the reference that the Examiner relies on as authority for the assertion.

Segar et al.

With regard to Segar et al., the Examiner found the reference to show “that magnetic leads that are formed as a junction in general, can by [sic.] ion implanted with non-ferromagnetic elements of boron or chromium for the advantage of improving magnetic properties (see Fig. 4 and col. 5, lines 35-56).” It is not clear what relevance this finding has with respect to independent claims 1, 19 and 31. Segar et al. fail to provide any disclosure of any “improvement” generated through the ion implantation of boron or chromium that would modify the disclosure of Tao et al. such that the combination of references discloses the reducing steps of claims 1 and 19, or the implanting step of claim 31. Additionally, the magnetic head of Segar et al. does not include a magnetoresistive sensor and there is no disclosure in Segar et al. relating to reducing magnetic conductivity of a junction of a magnetoresistive sensor or to implanting ions into a junction of a magnetoresistive sensor.

Accordingly, the combination of Tao et al. and Segar et al. fail to disclose or suggest the reducing step of claim 1, the reducing step of claim 19, or the implanting step of claim 31.

No Motivation or Suggestion to Combine References

Applicant also submits that the Examiner has failed to establish a *prima facie* case of obviousness against independent claims 1, 19 and 31 because there is no suggestion or

motivation for combining the cited references outside of Applicant's disclosure.

In justifying the combination of the references, the Examiner found that "[it] would have obvious to one of ordinary skill in the art at the time the invention was made to have modified the method of Knapp by including the ion planting [sic.] process of both Tao and Segar, for the associated advantages of improving magnetic properties and bridging the first and second magnetic leads in manufacturing the MR sensor."

The Examiner's finding of a suggestion or motivation to combine the references is erroneous for at least three reasons. First, nowhere in the cited sections of Segar et al. is there any suggestion of "improving the magnetic properties" in the manner resembling the formation of a constricted junction in a magnetoresistive sensor as described in claims 1, 19 and 31. Second, the Examiner has failed to identify where Knapp et al. express a need to "bridge" the cited magnetic leads 230, since element 253 apparently serves that function. Third, assuming Tao et al. disclose the formation of a nanojunction between magnetic leads of a magnetoresistive sensor, there is no suggestion of needing to further constrict the magnetic and/or electrical conductivity of such a nanojunction.

#### Consideration of the Invention as a Whole

Additionally, the mandate of 35 U.S.C. §103 is that the invention as a whole must be considered in a obviousness determination. A diversion of purpose between the claimed element and a corresponding element of a prior art reference is the basis for finding that the combination is not suggested. Thus, an important consideration in deciding whether an invalidating suggestion is present, is a comparison of the purpose, functions, and problems addressed by the present invention and that of the cited references.

One purpose addressed by the present invention and described in independent claims 1, 19 and 31 is to form a magnetoresistive sensor that is highly sensitive. Neither Tao et al. nor Segar et al. share a similar purpose. Additionally, in accordance with embodiments of the invention, the purpose of creating a highly sensitive magnetoresistive sensor is accomplished by creating a constricted junction between magnetic leads as described in independent claims 1, 19 and 31. None of the cited references taken alone or in combination with the other references

discloses or suggests the reduction to the electrical and magnetic conductivity of an outer shell portion of the magnetic junction, or the implantation of ions into the magnetic junction.

As a result, the Examiner must rely on the teachings of Applicant's disclosure to discern the "obviousness" of the claimed invention since, without Applicant's disclosure, neither the Examiner nor one skilled in the art would attempt to combine the cited teachings. For instance, the Examiner would not have found the "inherent" teaching of Tao et al. and Segar et al. mentioned above without the guidance of Applicant's disclosure, since the references have no relation to the formation of a constricted junction in a magnetoresistive sensor. Such use of hindsight is clearly improper. In re Lee, 61 USPQ2d 1430 (Fed. Cir. 2002)("It is improper, in determining whether a person of ordinary skill in the art would have been led to this combination of references, simply to '[use] that which the inventor taught against its teacher.'")(quoting W.L. Gore v. Garlock, Inc., 220 USPQ 303, 312-13 (Fed. Cir. 1983)).

#### Claims 1, 19 and 31 are Non-Obvious

Accordingly, Applicant submits that the Examiner has failed to establish a *prima facie* case of obviousness against independent claims 1, 19 and 31 because the cited references fail to disclose all of the claimed elements and there is no suggestion or motivation to combine the reference teachings outside of Applicant's disclosure. Therefore, Applicant requests that the rejections of independent claims 1, 19 and 31 be withdrawn. Additionally, Applicant submits that each of the rejected or withdrawn claims that depends from independent claims 1, 19 and 31 is allowable for at least the reasons set forth above.

Also in the Office Action, the Examiner rejected claim 35 under 35 U.S.C. §103(a) as being unpatentable over the prior art above as applied to claim 31, and further in view of Mao et al. (U.S. Patent No. 6,411,478). Applicant respectfully believes that claim 35 is allowable for at least the reasons set forth above, and requests that the rejection be withdrawn.

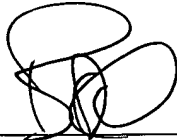
Conclusion

In view of the above comments and remarks, Applicant believes that the present application is in condition for allowance. Reconsideration and favorable action is respectfully requested.

The Director is authorized to charge any fee deficiency required by this paper or credit any overpayment to Deposit Account No. 23-1123.

Respectfully submitted,

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